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MOBILE RAILWAY INSTALLATION FOR TRANSPORTING BULK MATERIAL
[Gleisverfahrgbare Anlage zum Transport von Schüttgut]

J. Theurer, et al.

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Description /2*

This invention relates to a mobile railway installation for receiving, delivering, and transporting bulk material, in particular the excavated material accumulating while cleaning the ballast bed of tracks, consisting of at least two loading cars, coupled into a convoy to form a combined loading unit with car bodies for receiving the bulk material and conveyor belt arrangements arranged in the base region in the longitudinal direction thereof and provided with drives, the ends of the conveyor belt arrangements being arranged at different heights for the transfer of the bulk materials from one loading car to the following one.

Such a mobile railway installation having a plurality of loading cars coupled together to form a convoy is previously known from AT-PS 378 973. They have a conveyor belt arrangement, both for transporting and for storing bulk material, that comprises a conveyor belt arranged in the base region of an extended car body and a transfer conveyor belt connected to it in the transport direction. To supply the various drives, each loading car has its own power station. All drives for the conveyor belts of the various loading cars are connected to a central control unit arranged at the end of a facility for clearing the track bed. Because of the transfer conveyor belt projecting over the bumper, the bulk material is easily transferred from the known facility for

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* Number in the margin indicates pagination in the foreign text.

clearing the track bed to the following loading car. Here, when the conveyor belt arrangements run at a fast speed, the bulk material of the individual loading cars is transported to the last loading car, where it is stored while its base conveyor belts runs at a slow rotational speed. As soon as this loading car is filled to its limit, the movement of its base conveyor belt is stopped and, at the same time, the rotational speed of the base conveyor belt in the previous loading car is reduced, for storing the bulk material.

Such a mobile railway installation for receiving and transporting bulk material is also known from DE-U-88 13 859, where each loading car has only one conveyor belt arranged in the base region of the car body. Its front end region, in the transport direction, projects over the bumper of the loading car and is also arranged higher than at the opposite end. In this way, the bulk material is transferred directly from the base conveyor belt to the base conveyor belt of the subsequent loading car.

From FR-A-1395991 a loading device is known that has a contact device in the region of the car body that emits an appropriate signal when a certain degree of filling is reached in a filling bin.

The object of the present invention is to create a mobile railway installation of the type mentioned at the outset, with which simple loading can be achieved with a certain degree of automation.

This object is achieved in accordance with this invention with the characteristics indicated in the characterizing part of Claim 1. By the use of contact devices, significantly simplified loading of all loading cars is possible under the supervision of only one operator. Moreover, it is no longer necessary, as in the past, for this operator to climb onto each loading car and, in this tiresome way, to gain an overview. With the design of this invention, it is now advantageously possible to register in a timely manner from a central position the advanced filling state of the individual loading cars by way of an acoustic or optical signal, for example, from the contact device and to take the appropriate steps immediately. Most importantly, this control provides increased operator safety and the resulting greater concentration on monitoring, while avoiding the dangerous proximity to the hazardous zone of an adjacent track that inevitably and frequently occurs when changing from one loading car to another.

It is provided that the contact device is arranged in the region of a transfer conveyor belt for passing the bulk material to the next loading car, whereby the limited space in the car body formed by the contact device, on the one hand, and the car body end wall located in the region of the transfer conveyor belt, on the other hand, is approximately the same size as the bulk material volume on a conveyor belt arrangement of a loading car for transport onto another loading car. This contact device distance assures that, once a corresponding signal is emitted, there is still enough space for receiving the bulk

material on the conveyor belt arrangement of the following loading car, seen in the transport direction. As this loading car to the rear continues to be filled, this bulk material is dumped by the associated transfer conveyor belt onto the already nearly filled loading car.

If, as in an advantageous embodiment of the invention, the contact device is designed for emitting an acoustic and/or optical /3 signal, then this signal can also be recorded by the operator at various locations.

In another advantageous embodiment of the invention, the contact devices and the conveyor belt drives of all loading cars in the combined loading unit are connected to a central control unit on the latter. Such a combination of contact devices with a central control unit has the particular advantage that all loading cars can be controlled and monitored from a single location. Moreover, this also makes possible a permanent overview of the available loading capacity.

In an additional advantageous variation of the invention, the central control unit is designed so that, when a certain contact device is activated, it will automatically switch off the conveyor belt drives that are associated with the loading care having this activate contact device and the central control unit will automatically switch the conveyor belt drives located on the loading car located in front -- in the transport direction of the bulk material -- of this loading car having the activated contact device, from a fast to a slow rotational speed for storing bulk material. This

automation makes possible the completely automatic filling of all loading cars of a loading unit, independently of an operator.

In another preferred embodiment of the invention, he control unit for turning off the conveyor belt drives is designed with an optionally adjustable time delay of the signal emitted by the contact device with respect to the switching-off of the conveyor belt drives. With this time delay, all the bulk material stored in the loading car is transported in the direction of the transfer conveyor belt by the distance of the contact device from the face end of the car body wall. In this way, in the opposite end region of the car body a corresponding space is created at the same time for receiving the bulk material located on the conveyor belt arrangement of the subsequent loading car, which is continuously transferred to the previous loading car during the course of filling.

In accordance with an additional design of the invention, the loading unit consisting of a plurality of loading cars has, in addition to the central control unit, a central energy source for the supplying conveyor belt drives. With such a central energy source, the conveyor belt drives of the loading car are operable independently by a track-construction machine or the like, so that, in particular, the loading unit may be unloaded automatically. This is advantageous, in particular, if during continuous operation, for example, of a ballast roadbed cleaning machine two loading units of this invention are

alternately and independently used for loading and unloading the bulk material.

Particularly with a large number of loading car, the power supply of the conveyor belt drives is especially economical and simple if the central energy source is designed as a generator and the conveyor belt drives are designed as electric motors.

In an additional preferred embodiment of the invention, the contact device is designed as a light barrier, preferably arranged in the upper half of the side wall, running transverse to the longitudinal direction of the car body and approximately parallel to the conveyor belt arrangement. In this way, accumulation of bulk material in the car body is safely and reliably registered, whereby because of the higher arrangement of the light barrier, the latter does not respond when the bulk material is being transported through for storage on a previous loading car.

However, the contact device can also advantageously be designed as a mechanical pushbutton arranged on the side wall of the car body. Such a mechanical contact device is reliably activated by pressure from the bulk material and is well able to withstand the increased load caused by the friction from the bulk material.

Finally, in yet another advantageous embodiment of the invention, the central control unit and the central energy source for the loading unit are arranged on an unloading vehicle, which is located at the front end of the loading unit, in the transport direction of the bulk

material, and which has a delivery conveyor belt that may be swiveled laterally by way of a drive. With the help of such a specially made unloading vehicle at the front end of the loading unit, in the transport direction, the bulk material content stored therein can easily be dumped onto trucks located to the side of the track or onto cars located on an adjacent track.

The invention will be explained in greater detail below with the help of the exemplary embodiments shown in the drawing.

The figures show:

Figure 1: a schematic side view of a mobile railway installation comprising a plurality of loading cars for receiving, delivering, and transporting bulk material;

Figure 2: an enlarged side view of the facility in Fig. 1, whereby a contact device is associated with each loading car; /4

Figure 3: an additional side view of a loading car as in Fig. 2;

Figure 4: a schematic top view of a part of the loading car with a contact device designed as a light barrier, and

Figure 5: a top view of a part of a side wall of the loading car with a mechanical contact device.

A mobile railway installation and loading unit **1** seen in Fig. 1 comprises a plurality of loading cars **2** connected to one another. Each of these has a chassis frame **4** resting on wheel assemblies **3**, with which a car body **5**, open at the top, is connected. For transporting and storing bulk material, a conveyor belt arrangement **6** is provided

that comprises a conveyor belt **7**, arranged in the base region of car body **5** and extending in its longitudinal direction, and a transfer conveyor belt **9** projecting over bumper **8**. In car body **5** of each loading car **2** there is a contact device **10**, which is designed to emit an appropriate signal when a certain filling state is reached. Contact devices **10** and conveyor belt drives **11**, **12** of all loading cars **2** of combined loading unit **1** are connected via control lines **13**, **14** to a central control unit **15** and a central energy source **16**. A generator for supplying conveyor belt drives **11**, **12**, which are made in the form of electric motors, is provided as energy source **16**. Both central control unit **15** and central energy source **16** are arranged on an unloading vehicle **17** on the front end of loading unit **1**, in the transport direction of the bulk material. The unloading vehicle has an actuatable delivery conveyor belt **18**, which is pivotable about a vertical axis with the help of its own drive.

In Fig. 2, arrow **19** shows the transport direction of bulk material **20**. Conveyor belt drives **11**, **12** are made in such a way that both bottom conveyor belt **7** and projecting transfer conveyor belt **9** are movable at at least two different rotational speeds. Central control unit **15** is designed to automatically switch off drive **11** of bottom conveyor belt **7** located in the same loading car **2** when a certain contact device **10** is activated. Moreover, central control unit **15** is also designed to automatically switch conveyor belt drives **11**, **12**, located on loading car **2** disposed in front -- in the transport

direction of the bulk material -- of this loading car **2** having activated contact device **10**, from a fast to a slow rotational speed for storing bulk material. As seen, in particular, in the partial top view in Fig. 4, contact device **10** is arranged in the region of transfer conveyor belt **9**, which is made for dumping material onto the next loading car **2** and which is slightly pivotable about a vertical axis. Here, the space in car body **5** delimited by contact device **10**, on the one hand, and one car body end wall **21**, on the other, is approximately the same size as the bulk material volume on a conveyor belt arrangement **6** of a subsequent loading car **2**. Contact device **10** is designed as a light barrier, extending transverse to the longitudinal direction of car body **5** and approximately parallel to conveyor belt arrangement **6**.

A variation of a contact device **10** shown in Fig. 5 is designed as a mechanical pushbutton **22**, which is situated in a corresponding recess in a car body side wall **23** and which is pivotable in the direction indicated by the arrow. On the outside of car body side wall **23** a switch **24** is mounted that is activatable in the position of mechanical pushbutton **22** indicated by the dot-dashed line.

The method of operation of the installation or loading unit **1** of this invention will be described in greater detail below.

In the situation shown in Figs. 1 through 3, the front loading car **2** of loading unit **1** immediately next to unloading vehicle **17** is

being filled. For this purpose, the respective bottom conveyor belt **7** of this loading car **2** runs at a slow rotational speed, while the corresponding transfer conveyor belt **9** is not in operation. All conveyor belts **7** and transfer conveyor belts 9 of conveyor belt arrangement **6** subsequently located, in the transport direction of the bulk material, run at a higher rotational speed, whereby, for example, the continuously arriving excavated material from a subsequent ballast roadbed cleaning machine (not shown) is transported through all previous loading cars **2**. When, at a high degree of filling, contact device **10** of front loading car **2** currently being loaded responds (see Fig. 2), then a corresponding signal activates control unit **15** and the latter automatically switches the two conveyor belt drives **11**, **12** of the immediately subsequent, in the transport direction of the bulk material, loading car **2** to a slow rotational speed of conveyor belt arrangement **6**. Then, bulk materials **20** is stored in this immediately subsequent loading car **2**. Following a selectably adjustable time delay, control unit **15**, likewise

automatically, cuts off conveyor belt drive **11** of previous loading /5
cars **2** or the one immediately subsequent to unloading vehicle **17**, whereby the bulk material stored in it is transferred to the front car body end wall **21** (see Fig. 3). In this way, sufficient room is created in the rear end region of car body **5** for receiving the bulk material still lying on conveyor belt arrangement **6** of the immediately subsequent loading car **2**, which is now storing the material. During

the slow storage rotational speed of bottom conveyor belt **7** and of subsequent transfer conveyor belt **9**, the material is continuously dumped into subsequent car body **5**, as seen in Fig. 3.

As soon as the degree of filling in this subsequent loading car **2**, shown in Fig. 2 in the left half of the figure, also reaches the point at which the associated contact device **10** responds, a switch in conveyor belt drives **11**, **12** of the immediately subsequent loading car **2** is caused once again by central control unit **15** in the manner previously described. Likewise, drive **11** of loading car **2** having the activated contact device **10** is switched off, with the above-mentioned time delay.

After all four loading cars **2** forming a combined loading unit **1** in the exemplary embodiment shown in Fig. 1, have been filled, this loading unit **1** is taken to an unloading site together with the previous unloading vehicle **17**, with the help of a locomotive, for example. There the stored bulk material is dumped by delivery conveyor belt **18**, for example, onto trucks or onto a car on an adjacent track. Here, front loading car **2**, immediately connected to unloading vehicle **17**, is unloaded first, its conveyor belt arrangement **6** then being used to transport the bulk material on subsequent loading car **2**. During this unloading operation, a ballast roadbed cleaning machine, for example, on the track-laying site unimpededly delivers bulk material onto an additional loading unit **25** that is made in accordance with this invention. Loading unit **1**, which in the meantime has been

emptied, is returned to the site where it is being used, after which during continued unimpeded operation of the above-mentioned ballast roadbed cleaning machine, bulk material **20** stored in rear loading unit **25** is transferred to front loading unit **1**. Thus, a track construction machine can continuously dump bulk material unimpededly and unlimited in time, using a relatively small number of such loading cars **2**.

Claims

1. A mobile railway installation (1) for receiving, delivering, and transporting bulk material, in particular the excavated material accumulating while cleaning the ballast bed of tracks, consisting of at least two loading cars (2), coupled into a convoy to form a combined loading unit with car bodies (5) for receiving the bulk material and conveyor belt arrangements (6) arranged in the base region in the longitudinal direction thereof and provided with drives, the ends of the conveyor belt arrangements being arranged at different heights for the transfer of the bulk materials from one loading car (2) to the following one, characterized in that there is arranged in car body (5) of each loading car (2) a contact device (10), which is designed to emit an appropriate signal when a certain filling state is reached and which is arranged in the region of a transfer conveyor belt (9) designed to transfer bulk material to the following loading vehicle (2), the space defined by contact device (10), on the one hand, and by the car body end wall (21) located in the region of transfer conveyor belt (9), on the other, being about the same size as

the volume of bulk material located on a conveyor belt arrangement (6) of a loading car (2) for transporting on to another loading car (2).

2. An installation as recited in Claim 1, characterized in that contact device (10) is designed for emitting an acoustic and/or optical signal.

3. An installation as recited in one of the Claims 1 or 2, characterized in that contact devices (10) and conveyor belt-drives (11,12) of all loading cars (2) of combined loading unit (1) are connected to a central control unit (15) arranged on this loading unit.

4. An installation as recited in Claim 3, characterized in that central control unit (15) is designed, upon activation of a specific contact device (10), to switch off automatically conveyor belt drives (11,12), which are arranged on loading car (2) having this activated contact device (10) and that central control unit (15) is designed automatically to switch conveyor belt drives (11, 12), located on loading car (2) disposed in front -- in the transport direction of /6 the bulk material -- of this loading car (2) having activated contact device (10), from a fast to a slow rotational speed for storing bulk material.

5. An installation as recited in Claim 5, characterized in that control unit (15) is designed to switch off conveyor belt drives (11,12) with an optionally adjustable time delay of the signal emitted

by contact device (10) with respect to the switching-off of conveyor belt drives (11,12).

6. An installation as recited in one of the Claims 1 through 5, characterized in that loading unit (1), composed of several loading cars (2), also has in addition to central control unit (15) a central energy source (16) for supplying conveyor belt drives (11,12).

7. An installation as recited in Claim 6, characterized in that central energy source (16) is designed as a generator and conveyor belt drives (11,12) are designed as electric motors.

8. An installation as recited in one of the Claims 1 through 7, characterized in that contact device (10) is designed as a light barrier extending transversely to the longitudinal direction of car body (5) and approximately parallel to conveyor belt arrangement (6), preferably in the upper half of side wall (23).

9. An installation as recited in one of the Claims 1 through 7, characterized in that contact device (10) is designed as a mechanical pushbutton (22) arranged on side wall (23) of car body (5).

10. An installation as recited in one of the Claims 1 through 9, characterized in that central control unit (15) and central energy source (16) for loading unit (1) are arranged on an unloading vehicle (17) which is located at the front end of loading unit (1), in the transport direction of the bulk material, and has a delivery conveyor belt (18), which may be swiveled laterally by way of a drive.

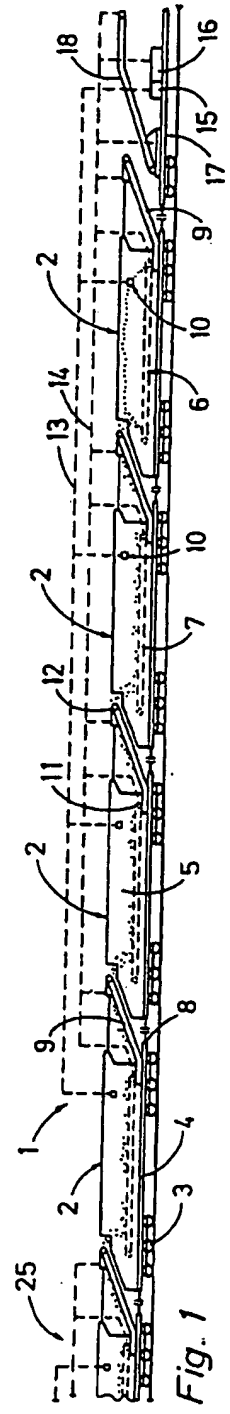

Fig. 1

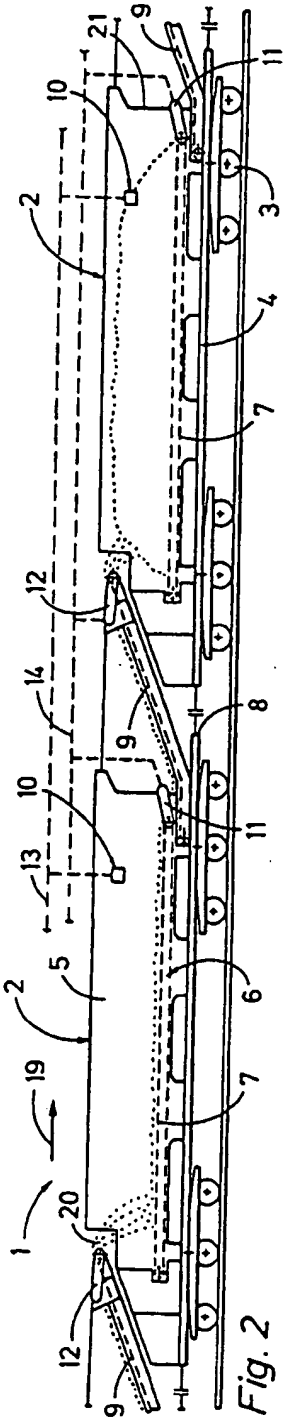

Fig. 2

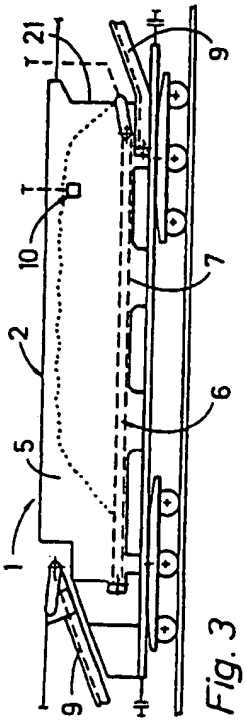

Fig. 4

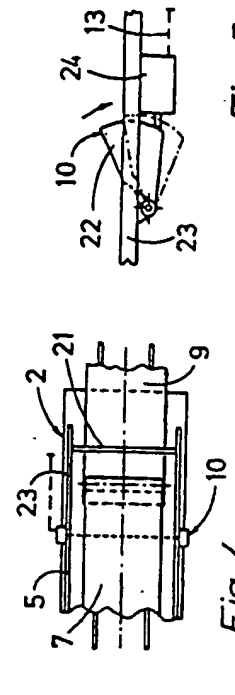

Fig. 5

Fig. 3